

WHAT IS CLAIMED IS:

1. An organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag, organometallic compound (II) of Formula 2 containing at least one of Au, Pd and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al, wherein the metal components of organometallic compounds (II) and (III), respectively, are present in an amount of 0.01~10mol% based on the mole amount of Ag in the organometallic compound (I):

Formula 1

wherein,

L is a neutral metallic ligand, which comprises 1~20 carbon atoms and a donor selected from the group consisting of N, P, O, S and As;

X is an anion selected from the group consisting of F⁻, Cl⁻, Br⁻, I⁻, alkoxide, hydroxy, cyano(CN⁻), nitro(NO₂⁻), nitrate(NO₃⁻), nitroxyl, azide, thiocyanate, isothiocyanate, tetraalkylborate, tetrahaloborate, hexafluorophosphate(PF₆⁻), triflate(CF₃SO₃⁻), tosylate(Ts⁻), sulfate(SO₄²⁻),

carbonate(CO_3^{2-}), carboxylate, diketonate and alkyl anion;

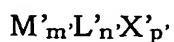
m is an integer from 1 to 10;

n is an integer from 0 to 40, provided that each L is the same or different in the case where n is 2 or higher, and provided that L functions as a ligand connecting Ag atoms in the case where m is 2 or higher;

p is an integer from 0 to 40, provided that each X is same or different in case that p is 2 or higher; and

both n and p are not zero at the same time;

Formula 2



wherein,

M' is Au, Pd or Ru;

L' is a neutral ligand comprising 1~20 carbon atoms, which is selected from the group consisting of amine compounds, phosphine compounds, phosphite compounds, phosphineoxide compounds, arsine compounds, thiol compounds, carbonyl compounds, alkenes, alkynes and arene;

X' is an anion selected from the group consisting of, F⁻, Cl⁻, Br⁻, I⁻, alkoxide, hydroxy, cyano(CN⁻), nitro(NO₂⁻), nitrate(NO₃⁻), nitroxyl, azide, thiocyanate, isothiocyanate, tetraalkylborate, tetrahaloborate, hexafluorophosphate(PF₆⁻), triflate(CF₃SO₃⁻), tosylate(Ts⁻), sulfate(SO₄²⁻), carbonate(CO₃²⁻), carboxylate, diketonate and alkyl anion;

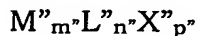
m' is an integer from 1 to 10;

n' is an integer from 0 to 40, provided that each L' is the same or different in the case where n' is 2 or higher, and provided that L' functions as a ligand connecting metal atoms in the case where m' is 2 or higher;

p' is an integer from 0 to 40, provided that each X' is the same or different in the case where p' is 2 or higher; and

both p' and n' are not zero at the same time; and

Formula 3



wherein,

M'' is Ti, Ta, Cr, Mo, Ru (provided that M' in Formula 2 is not Ru), Ni, Pd (provided that M' in Formula 2 is not Pd), Cu, Au (provided that M' in

Formula 2 is not Au) or Al;

L" is a neutral ligand comprising 1~20 carbon atoms, which is selected from the group consisting of amine compounds, phosphine compounds, phosphite compounds, phosphineoxide compounds, arsine compounds, thiol compounds, carbonyl compounds, alkenes, alkynes and arenes;

X" is an anion selected from the group consisting of F⁻, Cl⁻, Br⁻, I⁻, alkoxide, hydroxy, cyano(CN⁻), nitro(NO₂⁻), nitrate(NO₃⁻), nitroxyl, azide, thiocyanate, isothiocyanate, tetraalkylborate, tetrahaloborate, hexafluorophosphate(PF₆⁻), triflate(CF₃SO₃⁻), tosylate(Ts⁻), sulfate(SO₄²⁻), carbonate(CO₃²⁻), carboxylate, diketonate and alkyl anion;

m" is an integer from 1 to 10;

n" is an integer from 0 to 40, provided that each L" is the same or different in the case where n" is 2 or higher, and provided that L" functions as a ligand connecting metal atoms in the case where m" is 2 or higher; and

p" is an integer from 0 to 40, provided that each X" is the same or different in the case where p" is 2 or higher; and

both p" and n are not zero at the same time.

2. The composition according to claim 1, wherein L represents a neutral ligand selected from the group consisting of amine compounds, phosphine compounds, phosphite compounds, phosphineoxide compounds, arsine compounds, thiol compounds, carbonyl compounds, alkenes, alkynes and arene.
3. A method of forming a pattern of a metal alloy or oxide thereof, which comprises (i) dissolving the organometallic composition of claim 1 in an organic solvent to produce a coating solution; (ii) coating a substrate with the coating solution to form a coating film; (iii) exposing the coating film to a light source under a photomask having a desired pattern; and (iv) developing the exposed film.
4. The method according to claim 3, wherein the coating in step (ii) is accomplished by spin coating, roll coating, dip coating, spray coating, flow coating or screen printing.

5. The method according to claim 3, wherein the organic solvent in step (i) is selected from the group consisting of a nitrile-based solvent, an aliphatic hydrocarbon solvent, an aromatic hydrocarbon solvent, a ketone-based solvent, an ether-based solvent, an acetate-based solvent, an alcohol-based solvent, a silicon-based solvent, and mixtures thereof.

6. The method according to claim 3, wherein the light source in step (iii) is UV light.

7. The method according to claim 3, wherein the steps (iii) and (iv) are accomplished in a vacuum or in an atmosphere of air, O₂, H₂, N₂, Ar or a mixed gas thereof.

8. The method according to claim 3, further comprising the step of reduction or oxidation and/or the step of annealing.

9. The method according to claim 8, wherein the annealing is accomplished at a temperature of 300°C or lower in a vacuum or in an

atmosphere of air, N₂ gas or a N₂/H₂ mixed gas.

10. The method according to claim 3, wherein the steps (ii) through (iv) are repeated at least twice to produce a multi-layer pattern of metal alloy or oxide thereof.

11. A pattern of a metal alloy or oxide of an organometallic composition comprising organometallic compound (I) of Formula 1 containing Ag, organometallic compound (II) of Formula 2 containing at least one of Au, Pd and Ru, and organometallic compound (III) of Formula 3 containing at least one of Ti, Ta, Cr, Mo, Ru, Ni, Pd, Cu, Au and Al, wherein the metal components of organometallic compounds (II) and (III), respectively, are present in an amount of 0.01~10mol% based on the mole amount of Ag in the organometallic compound (I):

Formula 1



wherein,

L is a neutral metallic ligand, which comprises 1~20 carbon atoms

and a donor selected from the group consisting of N, P, O, S and As;

X is an anion selected from the group consisting of F⁻, Cl⁻, Br⁻, I⁻, alkoxide, hydroxy, cyano(CN⁻), nitro(NO₂⁻), nitrate(NO₃⁻), nitroxyl, azide, thiocyanate, isothiocyanate, tetraalkylborate, tetrahaloborate, hexafluorophosphate(PF₆⁻), triflate(CF₃SO₃⁻), tosylate(Ts⁻), sulfate(SO₄²⁻), carbonate(CO₃²⁻), carboxylate, diketonate and alkyl anion;

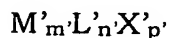
m is an integer from 1 to 10;

n is an integer from 0 to 40, provided that each L is the same or different in the case where n is 2 or higher, and provided that L functions as a ligand connecting Ag atoms in the case where m is 2 or higher;

p is an integer from 0 to 40, provided that each X is same or different in case that p is 2 or higher; and

both n and p are not zero at the same time;

Formula 2



wherein,

M' is Au, Pd or Ru;

L' is a neutral ligand comprising 1~20 carbon atoms, which is selected from the group consisting of amine compounds, phosphine compounds, phosphite compounds, phosphineoxide compounds, arsine compounds, thiol compounds, carbonyl compounds, alkenes, alkynes and arene;

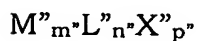
X' is an anion selected from the group consisting of, F⁻, Cl⁻, Br⁻, I⁻, alkoxide, hydroxy, cyano(CN⁻), nitro(NO₂⁻), nitrate(NO₃⁻), nitroxyl, azide, thiocyanate, isothiocyanate, tetraalkylborate, tetrahaloborate, hexafluorophosphate(PF₆⁻), triflate(CF₃SO₃⁻), tosylate(Ts⁻), sulfate(SO₄²⁻), carbonate(CO₃²⁻), carboxylate, diketonate and alkyl anion;

m' is an integer from 1 to 10;

n' is an integer from 0 to 40, provided that each L' is the same or different in the case where n' is 2 or higher, and provided that L' functions as a ligand connecting metal atoms in the case where m' is 2 or higher;

p' is an integer from 0 to 40, provided that each X' is the same or different in the case where p' is 2 or higher; and

both p' and n' are not zero at the same time; and

Formula 3

wherein,

M'' is Ti, Ta, Cr, Mo, Ru (provided that M' in Formula 2 is not Ru), Ni, Pd (provided that M' in Formula 2 is not Pd), Cu, Au (provided that M' in Formula 2 is not Au) or Al;

L'' is a neutral ligand comprising 1~20 carbon atoms, which is selected from the group consisting of amine compounds, phosphine compounds, phosphite compounds, phosphineoxide compounds, arsine compounds, thiol compounds, carbonyl compounds, alkenes, alkynes and arenes;

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different in the case where n'' is 2 or higher, and provided that L'' functions as a ligand connecting metal atoms in the case where m'' is 2 or higher; and

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both p'' and n are not zero at the same time.